Interdisciplinary Collaboration in Epidemiological Research : The way forward for Public Health in the Next Millenium

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Interdisciplinary collaboration in epidemiology is the need of the day It stems from epidemiologists demanding research needs, scientific opportunism and a wider change in the ethos of scientific research

Epidemiologists' changing research needs and levels of analysis Epidemiology seeks to explain, and generate knowledge to improve, population patterns of health, disease and well being Quantitative epidemiology was born out of the great differences in mortality across different social strata in the 17th century, with a central concern for public health and its social distribution [1]

Since then, depending on the prevalent disease causation theory, epidemiology has focused its attention on different factors as causes of disease Beginning with miasmatic theories of disease causation where diseases resulted from foul emanations of the soil air and water, the focus shifted to germ theory and specific aetiology of disease causation In the era of post World War II emergence of chronic diseases led to a shift in the causal factors from specific aetiologies to characteristics of individuals, their behaviour and lifestyle factors There was an emphasis on the exposure outcome relationship without the necessity for delineating intervening factors or pathogenesis the so-called "black box" approach[1]

Today, epidemiology is at the brink of a new thought paradigm based on the emergence of molecular biology and genetics Genes have been put forward as important factors in the occurrence of many diseases and even implicated in human behaviour and psychosocial characteristics This has been contrasted by the simultaneous emergence of the imperative to understand the social origins of disease Several recent communications on the role and future of epidemiology have emphasised the need for a social perspective and a more holistic approach to understanding disease distribution and causation[1,2,3,4,5]

There have been competing theories and conflicting explanations of disease causation since the medicine man, the priest, the herbalist and the magician all undertook in various ways to cure man's diseases and bring relief to the sick But there have never been more divergent levels of explanation as there are today with genetic factors at one end of the spectrum and societal factors at the other This fragmented thinking is evident in the emergence of different 'types' of Epidemiology "Genetic Epidemiology", "Risk factor epidemiology" and "Social epidemiology", each with its own literature[6] and proponents

Has this caused a dilution of epidemiology as a science? Is it under threat of merely becoming a method of measuring in a larger field, and incapable of making meaningful contributions to understanding disease aetiology[7,9] For example, will genetic epidemiology help measure disease distribution in the larger field of genetics in the future? Or has it been understood that the survival of epidemiology as a vibrant and independent field of medicine, hinges on the effective integration of social and biological factors and individual and group level factors in the study of health?

Susser's vision of a multi level epidemiology (Eco epidemiology) with its metaphor of Chinese boxes, is a timely reminder that societal, lifestyle and molecular explanations of disease are interconnected and mutually reinforcing, not stark alternatives in mortal combat against each other"[8] It should be realised that the study of disease can be conducted at different levels from the sub cellular to the societal Epidemiology can be a bridge across them respecting their specificity and understanding their necessity,

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"Rather than restricting the aims of epidemiology, we can consider its role in a much more attractive way that is, as the discipline of medical observation' -ranging from the molecular to the population domain"[9] Epidemiologists must acknowledge, and indeed propagate, the necessity of collaboration with other disciplines in order to retain for epidemiology its pre eminent position as the prime science of public health[8,9,10,11,12]

Seeking solutions to complex problems We know more about most diseases than we ever have -yet we are unable to design effective interventions for their control and prevention New diseases like nv CJD, chicken flu, Ebola virus, Hanta virus and HIV occupy our attention, while large populations in other parts of the world die simply of diarrhoea, respiratory infections and vaccine preventable diseases for which we have effective weapons, but are unable to deliver them appropriately - ineffective interventions[1]

Ironically, the contrasts in the state of health between developed and developing countries, the east and the west, rural and urban, and rich and poor have never been so glaring as they are today To explain these disparities concepts of social cohesion income inequality and sustainable development have emerged as important determinants of the health of individuals and populations[13,14,15]

In addition, there is the potential health impact of global climate change and the continuous damage the human race has done to the ecological infrastructure on this planet[16] These anticipated impacts threaten whole populations and defy measurement and understanding through epidemiologists' currently available tools

The goal of medicine today is no longer sickness-elimination, but has been broadened in scope and meaning to include prevention of disease, promotion of health and improvement in the quality of life of individuals and communities As the awareness of the problems that need solving overruns the aptness both of concepts and of available capabilities, epidemiologists have had to step back and examine their aims Why are we doing this? What is our primary aim? These questions should constitute the new imperative, replacing the oft repeated how should we proceed?[17]

As the major tool of Public Health research, the raison d'etre of Epidemiology is to obtain, interpret and use health information to promote health and reduce disease[18] We have been trapped into studying what is *measurable* rather than what is truly *relevant* No matter how hard it may be, it is still important to measure the *relevant* In order to do so effectively in the health scenario of today, epidemiology has to expand the tool kit that has served it well so far, but is limiting its present role

Epidemiology is just one of the approaches by which the major determinants of health in a population can be addressed, and it should be complemented by qualitative and historical studies, as well as other quantitative approaches[5] To expand its arsenal of investigative methods, epidemiology must collaborate with several disciplines

An interaction with social sciences is necessary to incorporate qualitative research methods and to get a holistic view of health problems in their social context A liaison with economics will enable us to quantify the costs and benefits of health in ways that many more can understand

Epidemiology needs to go beyond the study and analysis of the relationships between exposure and disease variables to include the analysis of systems Dynamic systems' models are supplementing fixed

mathematical relationships for predicting effects of interventions In this scenario, collaboration with biomathematicians, computer modellers and systems engineers for Health Systems Research helps to generate interventions and test their effectiveness in ways that were impossible before [19]

Collaborations to develop mathematical modelling of complex natural systems and population level processes are also necessary if epidemiologists are to help forecast the impact of climate change upon the range and activity of vector borne diseases and food-productivity[16]

An interface with specialised fields like molecular biology and genetics can aid understanding of etiological processes at the closest level There is also a need to develop and adopt statistical and mathematical methods that can accurately measure the effects of small changes, and predict disease burdens All of these interfaces are important and one may give different weights to each depending on the disease being studied and the questions one is seeking to answer

To open the black box Scientific Opportunism · Tools to explore almost any aspect of a disease now exist All the diseases that have pre-occupied medicine have been studied to the extent then available tools permitted In every era, the newest methods to study disease causation are used in the hope of finding the correct answer - as they should be

Today, genetics and molecular biology offer the most attractive and state of the art methods to explore disease causation at the micro level For example the methods of RFLP have led to the definitive tracking of TB from person to person, molecular biology and advanced microscopy have pin pointed the Human Papilloma Virus as the agent of cervical cancer and enabled us to understand prions as precursors of Kuru and CJD Genetic studies have identified specific genes for breast cancer and alcoholism and imaging techniques have allowed us to study brain lesions and specific patterns in neurological diseases with a refinement previously unimaginable Such refinement also clarifies intervening pathways and so elucidates -with precision causal processes and not merely causal factors[1] Only a very disinterested epidemiologist would not want to use these methods to explore elusive disease aetiologies! The desire to open the 'black box' that has so far been their lot is genuine, and these sophisticated methods provide ways to do so

While our new biological knowledge provides a depth of understanding of disease processes, the revolution in information technology has opened new possibilities for studying disease at a macro level with an unprecedented breadth of understanding and the recognition of dynamic patterns of disease causation Information systems can provide instant access to, and enable the continuous assemblage of existing stores of, vital statistics and other relevant health and social data across the world[1] These data can be used to describe distributions across societies, make comparisons of strata and groups nationally and internationally, to generate and test hypothesis and to serve as sampling frames[1]

The unfettered use of current advances in biomedical methods and information technology for epidemiological investigation should be the way forward in the field of Public Health in the new millennium

Epidemiology and poverty: Several authors have highlighted the importance of income inequality in determining life expectancy[3,13,14] More recently, the quantification of health effects in monetary terms came out of the economists' realm with the World Development Report of 1993[15] Since measures have evolved to quantify health in monetary terms, and health and development have been shown to be inextricably linked, epidemiologists do have a role to play in raising the issue of poverty as an important determinant of health and in designing effective interventions to curb poverty and its concurrent ill health[20] However, some have argued that poverty-eradication is something that epidemiologists are not equipped to handle[21] This is true to the extent that epidemiological methods were not invented to cope with the complexities of this arena[4] Thus there is a need to collaborate -with sociologists and economists to formulate research ideas and find appropriate solutions to these very complex problems

Epidemiology and the changing ethos of scientific research: There are changes in the scientific ethos of the day, where Cartesian reductionism is giving way to very fundamental changes in the way the scientific world thinks[4] The research on health has largely had a biomedical approach, underscoring the notion of health as the absence of disease The biomedical model is firmly within a positivist paradigm It is based on the belief that phenomena can be reduced to their constituent parts, measured and then causal relationships deduced Such thinking is linear and the idea that understanding the pieces allows us to understand the whole has indeed led to many discoveries This model has also had considerable use in developing ways of dealing with disease and repairing the body

By contrast the interactionist and constructivist approaches have been based on the belief that it is not possible to reduce phenomena to their constituent parts The approaches stress holistic understanding and the importance of context The emphasis is not measurement, but understanding

Although epidemiology is the study of the distribution and determinants of disease in populations, it has conceptualised populations as aggregates of individuals, rather than as groups of interacting individuals with social relationships and societal organisations and with group level properties that may partly influence risk of disease[5,6] An exclusive focus on individualising "risk" has hampered our ability to test more sophisticated and realistic models of disease causation

Recent years have seen physical sciences, especially Physics, move away from reductionist approaches to interactionist theories This move has been popularised in chaos theory and explained by means of a metaphor that "its like walking through a maze whose walls rearrange themselves with every step you take"[4] It may in fact be that research paradigms are less divided than they have been at other times in recent years HIV / AIDS research has been at the forefront of combining methodologies to assist understanding in public health, but there is scope for a lot more than has been done

A number of writers within the new public health movement have been advocating an eclectic use of methods for some years now[1,2,3] We are moving away from reductionist thinking to interactionist, the recognition of the individualistic fallacy as opposed to the ecological, and from black boxes to Chinese boxes -from viewing populations as collections of individuals to more than a sum of the whole If we accept that there is no universal right way to see the world, our methods should explore rather than deny the diversity[4] Epidemiology must embrace this thinking and engage more freely in interdisciplinary collaboration "

Conclusions: In the final analysis, the success of epidemiology as a science, will depend on its ability to develop sophisticated theories of cause that acknowledge and ultimately understand and predict, the complex systems in which the health-disease process is embedded[3,24] This demands a paradigm-shift in Epidemiology -and a need to broaden the thinking frame and expand one's tool kit in a move towards both good epidemiologic science and good public health policy[6] So that when History wants to know what we had done in our time and asks "Did they make life better?", it can be said that we tried our best in *all* the ways we knew

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BOOK REVIEW

Biomedical Waste Management in India, Dr N J Kishore, Dr G K Ingle; Century Publications - N Delhi; First Edition-2004; Medium sized soft jacket green cover; Pgs - 140, Price Rs. 140/-.

Biomedical waste management of late has received increasing attention & rightly so, in view of it's significance as biohazard as well as economic & legal implications. A plethora of material is available relating to various aspects of biomedical waste management. The book has come at the correct time when majority of the establishments concerned with biomedical waste management could do with a simple to understand compilation on the subject, which is available in this book. The authors have covered various aspects of the subject including classification of waste, it's hazards & reasonably well amplified the principles of management in different chapters with operational details. The book could do with better quality pictures & some avoidable spelling errors. The authors have done well to include reasonable details of legislations related to the subject. HIV & Hepatitis B have been included in the chapter on diseases related to biomedical waste in fair operational details although this section is likely to need frequent updating. Section on glossary of terms is quite useful. Waste audit questionnaire & check list for hospital waste management is an operationally useful managerial tool thoughtfully included in the book. The book also has a comprehensive up-to-date list of references, although numbering & citing of the references in the main text could make the book bilaterally active. Inclusion of addresses & manufacturers & suppliers of equipment related to biomedical waste management is a useful idea. The book is likely to be useful not only for medical & paramedical students but also for managers of biomedical waste management facilities. Next edition will be better utilizable with stronger / non spoilable cover in a hand book size fit for frequent use by managers like a manual. It is also likely to serve as resource material for training of staff of establishments generating biomedical waste, including private nursing homes & laboratories.

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Interdisciplinary research collaborations. A guide to creating new research teams. CITE THIS. By Joshua C. Palmer. As psychological scientists, we are often trained in a variety of research methods, theories and content areas that can be applied in multiple contexts. Our comprehensive training allows us to contribute to and advance knowledge across disciplines.Â Interdisciplinary collaborations have provided and will continue to provide findings that change the way we look at problems. As psychological scientists, it is essential that we work with colleagues from other disciplines and learn to embrace our commonalities and engage in a civil dialogue based on empiricism and scientific theory.